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roof, cutting off the space for the two upper trays, and omitting the partition from this space. When packed with nests of the Fielde type the whole outfit weighed about twenty-six pounds; but when packed with my aluminum nests, only about half as much, the weight of the case alone being about six pounds.

A strong leather shawl-strap, with stout handle, was used in carrying the case.

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COMPARISON OF CÆNOLESTES WITH POLYPROTODONTA AND DIPROTODONTA

Cænolestes has been described by Mr. Oldfield Thomas (1895) who placed it in the family Epanorthidæ of the suborder Diprotodonta, which includes several fossil forms described by Ameghino. Sinclair, however, in the "Report of the Princeton Patagonian Expedition" (1901–6) gives the name Cænolestidæ to these small Santa Cruz Diprotodonts, from the genus Cænolestes, which, although a modern form, is more primitive than any of these fossils in regard to the diprotodont character of the teeth.

In view of the phyletic interest attaching to this form, as perhaps the starting point for the evolution of diprotodont tooth structure, it was considered advisable to make more completely detailed drawings of the skull than had before been done, in respect principally to sutures and foramina, and to compare skull and other characters with types of Polyprotodonta and Diprotodonta.

The skull from which the accompanying drawings were made is the specimen which Sinclair figured in his report, loaned to me through the courtesy of Dr. J. A. Allen, from the collection of the American Museum of Natural History. I am indebted also to Mr. W. K. Gregory, of the museum, for many helpful suggestions during the course of the work.

Among the general marsupial characters of the skull of Cænolestes may be mentioned the following: absence of pituitary fossa and clinoid process, terminal nares, nasals broad posteriorly, malar forming wall of glenoid fossa, premaxillæ not touching frontals; on the ventral surface—palatal vacuities and palatal ridge, small lamellar pterygoids, alisphenoid bulla, and annular tympanic.

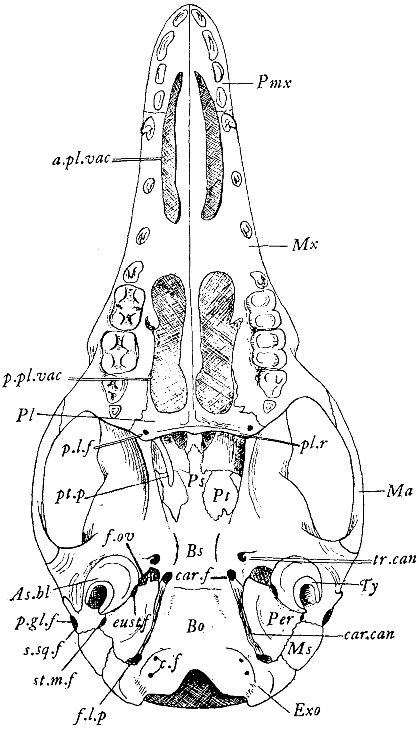

FIG. 1. Palatal aspect of cranium of *Cænolestes obscurus*, × 3. *As.bl*, alisphenoid bulla; *a.pl.vac*, anterior palatine vacuity; *Bo*, basioccipital; *Bs*, basisphenoid; *c.f*, condylar foramina; *car.can*, carotid canal; *car.f*, carotid foramen; *eust.f*, Eustachian opening; *Exo*, exoccipital; *f.ov*, foramen ovale; *f.l.p*, foramen lacerum posterius; *Ma*, malar; *Ms*, mastoid; *Mx*, maxilla; *Per*, periotic; *p.gl.f*, post-glenoid foramen; *Pl*, palatine; *p.l.f*, postero-lateral foramen; *pl.r*, palatal ridge; *p.pl.vac*, posterior palatine vacuity; *Ps*, presphenoid; *Pt*, pterygoid; *pt.p*, pterygoid process of palatine; *Pmx*, premaxilla; *s.sq.f*, subsquamosal foramen; *st.m.f*, stylomastoid foramen; *tr.can*, transverse canal; *Ty*, tympanic.

Marsupial characters in the foramina are seen in the following: foramen lacerum anterius confluent with optic (sphenorbital foramen); presence of postero-lateral palatine foramina, lachrymal duct on anterior margin of orbit, transverse canal, carotid foramen perforating basisphenoid, double condylar foramina, subsquamosal foramen. In identifying foramina in the squamosal I have followed the descriptions given by Cope.

Two characters more or less peculiar to Cænolestes are, as mentioned by Thomas: pterygoid processes of palatine long, slender and delicate; ant-orbital vacuity between nasals and maxillæ, found elsewhere only in ruminants.

Polyprotodont Characters.

1. Dental formula like that of the Dasyurid genera Thylacinus, Phascologale, namely:

$$\mathrm{i}\,\tfrac{4}{3}\,\mathrm{c}\,\tfrac{1}{1}\,\mathrm{pm}\,\tfrac{3}{3}\,\mathrm{m}\,\tfrac{4}{3};$$

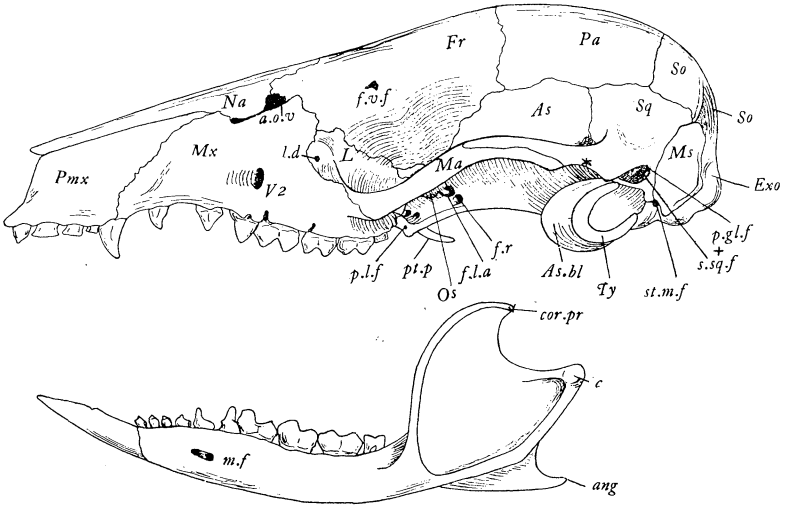

Fig. 2. Side view of skull of *Cænolestes*, × 3. *a.o.v*, Antorbital vacuity; *ang*, angle; *As*, alisphenoid; *As.bl*, alisphenoid bulla; *c*, condyle; *cor.pr*, coronoid process; *Exo*, exoccipital; *f.l.a*, sphenorbital foramen; *f.r*, foramen rotundum; *f.v.f*, venous foramen in frontal; *Fr*, frontal; *L*, lachrymal; *l.d*, lachrymal duct; *m.f*, mental foramen; *Ma*, malar; *Ms*. mastoid; *Mx*, maxilla; *Na*, nasal; *Os*, orbitosphenoid; *p.gl.f*, post glenoid foramen; *p.l.f*, postero-lateral foramen; *Pa*, parietal; *Pmx*, premaxilla; *pt.p*, pterygoid process of palatine; *s.sq.f*, subsquamosal foramen; *So*, supra-occipital; *Sq*, squamosal; *st.m.f*, stylomastoid foramen; *Ty* tympanic; V^2, infra-orbital foramen. The * indicates the part of the cranium with which the condyle of the mandible articulates.

in this family the incisors are numerous, small, subequal, canines larger than incisors. This agrees with the condition in the upper jaw of Cænolestes.

2. Close resemblance in external form to Phascologale—rat-like or opossum-like in form (Thomas).

3. Resemblance to Dasyurus skull, (*a*) in general shape, (*b*)

pterygoid processes of palatine slender and delicate (in the specimen figured the process is missing from the left side), (*c*) alisphenoid bullæ similar in general form.

4. Marked resemblance to Antechinomys and Sminthopsis skulls in size, shape and delicate character of the bones; absence of strong crests or ridges.

5. Palate long and narrow, similar to characteristic Polyprotodont form, with long and narrow palatal vacuities.

6. Lower jaw very similar to Dasyurus, Phascologale, and especially to Antechinomys and Sminthopsis in inflection of angle, and proportionate size of angle, condyle and coronoid.

7. Rudimentary pouch (Thomas, after Tomes), as in Phascologale and Marmosa.

8. Fore and hind limbs about equal.

9. Pes non-syndactyl as in Dasyures and opossums.

10. Foot plantigrade—resembles Phascologale in number and position of pads, and short clawless hallux (Thomas).

Diprotodont Characters (Thomas, Sinclair).

1. Condition of teeth—(*a*) one large lower incisor, cutting, forward projecting, (*b*) other incisors and canine in lower jaw vestigial as in Epanorthidæ, (*c*) anterior premolars small, showing tendency toward condition seen in Phalangers, where they are vestigial.

2. Pattern of teeth—molars like Phalanger molars rather than the Polyprotodont type. In Petauroides and Trichosurus there are four cusps on incipient ridges; in Cænolestes the ridges have increased in extent to form a lophodont type.

CONCLUSION

Sinclair concluded that Cænolestes is very like the primitive Phalangers, and the two families are probably related, not convergent; that, while the fossil Cænolestidæ are too specialized in tooth structure to be the direct ancestors of the Phalangers, yet there is probably a common ancestry. Later, he gave weight to the possibility of convergence to account for the resemblance in tooth structure (p. 443). This latter view would seem to be more in accord with the facts known about Cænolestes, for excepting tooth structure, there appears to be no other important character which links it with the Diprotodonts and there are several, as given above, which link it with the Polyprotodonts.

While there is undeniably a series of forms connecting Cænolestes with the Diprotodonts in tooth structure, yet Cænolestes itself is so generalized in this respect that we may perhaps in the absence of other corroborating characters, question its inclusion within this group. Possibly it may be found to be an offshoot from the Polyprotodonts, as it appears structurally to be more generalized than any Diprotodont, and therefore it might well occupy a separate suborder, as Thomas suggested—the Paucituberculata of Ameghino.

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Columbia University,
May 26, 1909.

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